The Tragedy of The Anti-Commons

The Commons

The Commons are historically understood as the natural world endowed to all of humanity. This is, the cultural and natural resources accessible to all members of a society, including natural materials such as air, water, and a habitable earth. These resources are held in common, not owned privately. Commons can also be understood as natural resources that groups of people (communities, user groups) manage for individual and collective benefit[1,2], in which individual, unmanaged and arbitrary use subtracts an aliquot of the resource from the community. Characteristically, this involves a variety of informal norms and values (social practice) employed for a governance mechanism[1-3]. In the modern world the commons are first and foremost contextual and contingent[3], as they include elements of the natural world not historically considered within human reach or prerogative. The commons acquire *meaning* the moment in which they are demanded for politically. Thus, for instance, the mineral resources of Mars may soon be considered The Commons. A particular commons, say a forest, cannot be divorced from the cultural, social, economic or environmental context in which it exists. The factors that determine global climate are The Commons for humanity, and the failure to act decisively to avoid climate change reflects a failure to consider both the relevant science and the relational aspect of problem. Today we should also consider literature, art, science, and knowledge in general within the commons. For example, the internet or world wide web, is a commons; technology and standards enable a community of users to share data, information, and knowledge. While it may appear that these realms lack the attribute of subtractability that define traditional commons, for instance knowledge appears to be non-subtractable, in practice the misuses or dishonest uses of the resource effectively subtract wealth from the commons. The wealth of accurate, objective information available in the internet community is diminish by dishonest practices. Thus, the effective wealth of knowledge is diminished by selfish, norm-free, predatory behavior. The same is true of science and novel technologies, since the effective consequences of excessively greedy or predatory behavior is a subtraction from the unbiased potential of the knowledge. The problem we concern here with is growth of knowledge and development of technology tools well ahead of norms, in fact ahead of any public awareness about them.

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The exploitation of resources held in common by individual norm-free behavior results in a destruction of the resource. This dilemma was popularized by Hardin in 1968[4], in an analysis which confused open access with common pool resources. The most important scenarios where a tragedy of the commons is happening today in real time while little of consequence is done, are at the global scale. Worse yet, in the last thirty years a neoliberal ideology proposing free markets and privatization as the solution for all problems across societies has been very successful in taking over policy, globally. We are only beginning to see the consequences, as the incentive structures remorselessly work out consequences. We owe much of the current scholarly discussion about the commons to one article that probably unconsciously attempted to analyze The Commons within the narrow constraints of a neoliberal ideology that viewed privatization as the only tool available while ignoring history, sophisticated and scholarly as it was, nonetheless. The 1968 article "The tragedy of the commons"[4] appears to be captive to a preconceived political conviction or at least a narrow context, rather than a scientific exploration of the problem. In his analysis, Hardin[4] artificially constructed the case for top-down government intervention and private enclosure as politics of "privatization or socialism". Yet the merits of the article are high indeed,

including its shortcomings. The impact of the article has been enormous and very positive, as it brought the subject into public discussion, and has been prompting scholarly answers refuting it for decades. In part, the merits of the article are literary, it is superbly well written and can work as a political instrument. The potential for many of its flawed or partial ideas to publicly distort a serious, scientific understanding of the subject is therefore high. The analysis it presents is taken directly towards the hypothetical solution of enclosement by private or government property for any commons. Privatization of all commons perfectly fits with the neoliberal free markets ideology that took over policy since the 1980s. Hardin seems to reduce the problem of the commons to a black-and-white choice: either socialism as understood in the north American context, or the full-fledge private enterprise of free markets[6]. Scholarly work has shown that in general, centralized and privatized management results in clearly worse outcomes for the preservation of commons[2,5,6]. Furthermore, free market or neoliberal capitalist approaches to intellectual property have been shown to also be capable of destroying commons through a dispersion of privatized claims that leads to wasteful underuse of resources[7]. But the real problem with that sort of directional analysis is that the most important commons today, those critical for large proportion of the people on the planet, are global. The tragedies to the commons happening today transcend national boundaries. For example, in addition to the problem of carbon emissions and global climate change, there are problems with subsurface pollution due to industrialized agricultural practices, the consequences of both these problems to rivers and oceans, forest management, and potentially with practically all new technologies, from genetic engineering tools and nanobiotechnology to the misuse of so called "social media" and modern high-tech communications in general.

Fallacies in the analysis presented by Garret Hardin in "The Tragedy of The Commons"[4].

The first fallacy is the axiomatic assumption that human population growth rate is and always will be geometric, as stated by Malthus. There are developed countries for which this is not true at all, for example Japan and Italy. The world is an heterogenous place and taken as a whole population growth rate is a global problem today, but there is no way of knowing how each region will change as they develop and incorporate technology. It would be at least as reasonable to expect that all regions of the world eventually reach a negative rate of population growth as they reach high levels of development and well-being as developed countries. In any case, that there are cultures which do not follow this starting assumption, proves that we cannot assume it to be a fixed law of nature valid, always, for all cultures through their history. Cultures evolve and change, people change, and the underlying reasons for cultural patterns change; e.g. poverty is in itself a reason why poor people societies have high fertility rates, and a level of affluence that allows for the actualization of individual human potential is a reason people in rich countries have a low fertility rate. The problem is real and got us where we are, pollution and global climate change, but there is no way to know what the growth rate will be in 100 or 200 years. By then the current neglect of the most important commons, the climate, may cause a large population change is the planetary homeostasis mechanisms remorselessly work out a new equilibrium.

The second fallacy is the interpretation given to Bentham's goal of "the greatest good for the greatest number". It is very odd to think that Bentham thought of "the greatest good" as the absolute maximum in a mindset of infinitesimal calculus, as Hardin puts it. The most natural way to reframe Bentham's statement in mathematical terms would be, of course, in terms of maxima for a manifold subject to constraints. And the manifold would consist of linked variables, i.e, "the good" for a multitude of human beings; it patently makes no sense to maximize the good for a single, isolated human being in the Universe. Furthermore, searching for an "acceptable and stable" solution is only meaningful as an

exercise towards the development of a methodology. By construction Bentham's concept would have implicitly considered "a system" (as in "a society", or a "community of societies"), and can always use rationality to search for linkages and interactions between the variables that either increase the maxima or allow for an expansion of the set to a larger number. Which takes us to the second oddity in the way Hardin interprets Bentham's "greatest number": as maximizing total population. This interpretation taken to an extreme means taking the limit towards infinite population. In a finite world this means taking the limit of the energy consumed by each "population unit", i.e. each individual, towards zero; "the greatest number" would thus be composed of nearly frozen, static individuals, as if the original statement had been meant to mean the largest possible number of crystals. That hardly was anywhere near the original mental exercise.

Setting up the argument in this fashion, the whole exercise is directed towards a limited set of preconceived conclusions and falsifies Bentham's concepts and goals; what Bentham most likely meant was hardly Hardin's impersonation, a dogmatic and oversimplified reading of his statement; or, at least, any sensical modern reading of Bentham would avoid such an out-of-context reading depleted of nuance and context. It is very hard to read in Bentham the aim for an absolute maximum population size, and not a maximum achievable but reasonable, nonsensical, level of happiness for the maximum number of people given a society. Bentham appears to be concerned with the optimization of the distribution of well-being, not with the maximization of population numbers. Moreover, the optimum will certainly be a moving target.

After trivializing one of the main new ideas of Bentham in his time, Hardin moves on to introduce private property as the inevitable practical solution. The work of Ostrom and many others[3-6] refutes Hardin's views, proving that across cultures all over the world there have been historically, and there are currently, commons managed collectively by communities, according to norms and rules and without the need for the introduction of private property. It would probably not be fair to regard Hardin as dishonest at all, in fact, all the contrary since he was a no-nonsense scholar who found himself at odds across communities because of his uncompromising views. That Hardin's views are probably due to a very specific mindset, within his specific and narrow cultural heritage, can be seen in his analysis of the morality of a few actions such as killing a bison in the North American plains 150 years ago. His view is anthropocentric to an extreme perhaps only possible within humanism, where mankind is the center of everything, and within illuminism where the purpose of science is to understand nature only to turn it to human use, and within the ideological contrasts of his time, his home country and his home state. After all, Hayek influenced intellectual across the ideological spectrum around that time, and his concepts underpinned the "neoconservative" movement in north America. Hardin's article may well be a product of the times and the partial views a result of north American nativism. In any case, his proposed solutions are entirely top-down, non-egalitarian, not even democratic, in addition to reductionist. A mechanistic and operational view of nature as the bounty endowed to mankind misses out, by construction default, the nuanced complexity of systems which taken out of equilibrium create negative feedbacks, backlashes. In the extreme form of illuminism reductionist views, there is no notion of anything else to respect other than immediate human needs, and no concern for the biosphere and other animals per se, not even respect for the unknown.

Perhaps the most benign assessment of Hardin's article is to see his partial view and biased recommendation as the result of two involuntary shortcomings. One flaw in his argument appears to be that he neglects historical, sociological and anthropological evidence of very well managed commons.

His view remains narrowly constrained to his inherited understanding, in his context and sub-culture, of the commons as the natural resources and environment for us to plunder. Thus, for him the commons quite naturally equate to the horror of spoliation. As the scholar he was, perhaps he could not imagine that other cultures, natives, Asians, Africans, farmers, hunter-gatherers could possibly offer illuminating lessons. The second flaw appears to be an equally closed-minded understanding of private property, combined with a degree of self-righteousness. He recognizes and describes the problem of "quis custodiet Ipsos custodes", the need to control the enforcers, the ultimate problem in any top-down arrangement. Yet he ends up proposing hypothetical solutions that rely on a vertical authority structure and considering coercion as the indispensable mean for action. This premise is taken to absurdity in the case of global commons. But even for a national, north American case, if one assumes the mechanisms exist to keep the custodian (of an enclosed commons) honest, then why not expand the mechanisms to keep the stakeholders of a commons honest. If we can solve the problem of "who supervises the custodians", then we could presumably solve the problem of supervising the commons. The experience of lobbies in the US offers today enough evidence that bureaus can evolve to bodies which make public statements about the public good while slicing the structure to give special interest a differential access or advantage. Any top-down approach runs into difficult paradoxes in a global context, and this is one of the best reasons to focus on bottom-up approaches instead as this is in keeping with reality.

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All of Hardin's analysis is based on a conceptual dichotomy: either some sort of coerced enclosure, or the freedom of action of unconnected individuals not embedded in any fabric at all, selfish and norm-free. And perhaps such a perception is typical of a North American historical wild west world view and character. Valuable as it may be, hardly universal. A rather similar, localist and ideological contextual narrow view appears to constrain the formulation of the concept of anti-commons as the failure to efficiently use a commons due to excess privatization[7]. Indeed, in this conception an anti-commons is the mirror image of Hardin's tragedy of the commons. In both cases they view a common as the antonym of private property, and destruction of the commons due to free entry versus management through private property as the only possible alternatives. However, as the commons is a rich and varied conceptual framework, so is the anti-commons as a conceptual tool of analysis. Conceptually the tragedy of the anti-commons includes all the mechanisms of destruction of a common due to intervention by governments, e.g. the creation of an anti-commons in place of a functioning commons. These interventions could include privatization, government enclosure and destruction due to ineffective control, privatization of use only and spoliation by users, privatization of knowledge and concomitant financialization of research results, formation of oligopolies, monopolies, rent practices, and other ones. The solution to the tragedy of the commons could very well lie in the opposite direction to Hardin's recipe: for a common to be managed as well as conceivable, perhaps we could advocate first the factual recognition of the sphere of validity for designating a field as a commons, and then the creation of norms for involvement of stakeholders rather than enclosure and privatization. The solution of the tragedy of the anti-commons is therefore of the same kind: as soon as a field is recognized as a commons, the framework of enclosure is the agency by which mechanisms, incentives, disincentives, controls, will lead to "the working of things". Alfred North Whitehead understood the essence of tragedy: "The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things." If we are to correct the consequences of "the remorselessly working of things", we must factually and objectively understand

the machinery we set up and how it works to compound these consequences. Only then we can hope to correct the consequences.

The Commons today include science and knowledge.

Hardin's essay and Crowe's reply address the intersection of "Problems with No Technical Solution" and "Problems with No Political Solution". It can be argued that since both articles were written we have witness a revolutionary change in technology, thereby moving the boundary of technical solutions, while no significant improvement has occurred in politics. Indeed, the biggest tragedy of the commons in human history, the human impact on global climate, is happening before us unaddressed, while practically all the technologies to avoid it already exist. Some of the new technologies we should be concerned with today, e.g. new energy production and storage, automation, artificial intelligence, provide technical solutions to the problems created by the modern industrial revolution. While cleaner energy sources and powerful storage can address the pollution created by fossil fuels, automation and artificial intelligence could take human beings out of mechanical uninteresting types of work and other low meaning and alienating work and relocated them to new tasks requiring the use of a wider range of cognitive abilities and creativity. Many new technologies open completely new possibilities since they are based on new scientific findings which underpin new tools, new processes, and create new entities. Material Sciences has created new materials across a range of scales, and the combination of molecular biology with material sciences is creating biological or hybrid biological and inorganic nanomaterials. Genetic engineering new tools can quite easily create new strains and new species of plants and animals, and their release to nature would results in interactions and feedback loops of such a complexity that science can not predict outcomes. New technologies have today the potential to create new problems with no known solution, for which we have no need. It would be much wiser to control the process and the rate of incorporation of innovation into applications released to nature and society through industry and commerce, than repeat the fast pace damage to the commons caused by previous industrialization waves. Because of globalization, the same new technologies or at least key elements of new technologies are today being tinker with pretty much all over the world. The knowledge commons, just as the global climate commons, are global commons and no ultimate solution can be reached unless it is a global solution. And any set of enclosure rules could potentially lead to a tragedy of anti-commons if they work out a wrong outcome. For instance, it is sufficient for a single genetically engineered strain to be released to nature to potentially alter an ecological or health balance.

Nobody voted for the industrial revolution and the various types and waves of industrialization. However, new technologies and resources always created and destroyed occupations and ways of life. They did select people as "factors of input", but at least they did not select people as targets for spoliation per se, they did not prey on individuals one by one. Data, the informatics and AI data-based algorithms could repeat the type of disruptions brought about by the industrial revolution, but they could also be much worse yet by selecting how to target people according to their own risk exposures, preying on sets of individuals. Beyond creating and destroying occupations they could create dependent captive markets. This would mean making people targets of parasitic exploitation. They easiest example is genetical data being used as means to personalize health insurance and drugs as a business opportunity instead of shared public good.

The human genome project (HGP) illustrates the tragedy of the anti-commons. The legal framework for patents in the US since the Bayh-Dole legislation in 1980 encourages the privatization of knowledge

promising the financialization of research results with commercial potential; knowledge is effectively taken out of the commons through patents, license agreements, start-ups, and deals with large scale pharmaceutical corporations. It is easy for positive feedback loops between exaggerated scientific expectations and financial expectations to reinforce each other and create a bubble; this is exactly what happened with HGP. The deflation of the bubble created a large amount of waste of two kinds: the waste in economic resources, and the waste of lost opportunities for more fruitful research. It will take decades to exploit the fruits of the HGP, via a slow and arduous process aiming at disentangling the extraordinary complexity of the human complex body. The HGP has ushered other initiatives, based on the recognition that there is much that genomics cannot do, and this potential for public benefit lies within the commons. It is worthwhile to mention that the public remained largely ignorant of the project even after it had been under way for a couple of years and had therefore no choice even of being credulous or incredulous, let alone any say in resource allocation. The HGP also best illustrates the dangers to the commons from a combination of two unrelated technological developments, genomics and information and data management. The ability to sequence the genomes of individuals and to compare any gene with those of the rest of the population is an example of knowledge and science creating a new commons: personalized medical care, enhancing prevention and therapeutics. The rules created by public policy for the handling of information provide the enclosure, and potentially the entry points of selfish or predatory behavior. If such behavior is allowed, a subtraction to the common results through the distorted or perverted use of the knowledge. A tragedy of anti-commons may result whereby a society ends up considerably worse off than initially, in the absence of new knowledge. Specifically, in this case, the day individual genomics data and personal information are open and available within health care systems, even with the best intentions, we will risk a huge anti-commons tragedy: On one hand, the potential use of such information could increase the common good and improve the way individuals are treated. On the other hand, it would create the potential for providers to select people. This would be a profitable business model: this data can be used to better treat people, it can be used to monitor patients, but it can also be sold to an insurer that will have intelligence on people and their medical risks and could get a high return out of this information. Only a precautionary, recursive design of policy could avoid these risks.

We seem to have a level of scientific and technical knowledge today in our hands mightily sufficient to change every process inherited from the modern industrial revolution for new processes with minimum level of externalities. Science and technology themselves could provide the tools to leverage a precautionary path towards the release of new technologies only when recursive testing have found them robust and safe; when we can be sure that by and large they provide a clearer better way forward. One mechanism should be the creation of feedbacks reporting objectively to an informed public, the stakeholders of the commons. The other mechanism should be the development of monitoring devices for key variables in nature, such as chemicals, gases, and nanoparticles, genes, microbes, materials, and changes in environmental parameters in general for specific circumstances and locations.

One key question ahead is whether we would ever be able to assert collective preferences and articulate them with universal values. Only then could we hope to solve the problem of the new, global commons.

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